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OLIGOCHAETA

PART II. EARTHWORMS

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(Text-figs. 1-3)

INTRODUCTION

THE collection of earthworms made by the Discovery Expedition comprises fifteen species from five major localities, viz. the islands of Annobon in the Gulf of Guinea, Tristan da Cunha, South Georgia, the Falkland Islands and Hermite Island, Cape Horn.

From Annobon only one species was obtained, *Dichogaster bolau* var.; it is not the same as the form of this species previously recorded from the island (see p. 287), but since this species is a peregrine of wide distribution in warm countries there is nothing remarkable in this. Apparently no other species of earthworm has so far been recorded from Annobon.

From Tristan da Cunha only five peregrine Lumbricids were obtained; this is to be expected from a volcanic, oceanic island. It is interesting to find that one of these species, *Lumbricus rubellus*, apparently forms a distinct race on the island (see p. 289). In the collection of the South African Museum, Cape Town, there are specimens from Tristan da Cunha (examined by myself) of two of the species here recorded, viz. *Allolobophora caliginosa* and *Lumbricus rubellus*. Apparently no other collections of earthworms from the island have as yet been examined.

From the island of South Georgia only one species is recorded, *Microscolex georgianus*; this species occurred abundantly in the collections made by the Discovery Expedition in various parts of the island. This species is endemic to South Georgia, but is closely allied to species from the Falkland Islands (a variety, var. *laevis*, is described by Rosa¹ from Patagonia, but is of doubtful status). An extremely interesting new form of *M. georgianus* occurred together with the typical form from one locality in the present collections; in this form microscolecine reduction has occurred without affecting any other characters.

From the Falkland Islands two endemic species of *Microscolex*, and two peregrine Lumbricids, viz. *Dendrobaena subrubicunda* and *Bimastus tenuis*, were found in the present collections. The latter are of especial interest in that they both show a peculiar restriction of the gizzard to segment 17. Michaelsen² has previously recorded *D. subrubicunda* from this locality, but does not comment on the position of the gizzard. Of

¹ Rosa, *Atti. Soc. Modena* (4), IV, p. 9.

² Michaelsen, W., *Ergeb. Hamb. Magalh. Sammelr., Terricolen* (Nachtrag), p. 27.

the two species of *Microscolex*, one is the well-known endemic, *M. falclandicus*; the other is apparently referable to the less-known species *M. aquarumdulcium*. Two other species of this genus have previously been recorded from the Falkland Islands, viz. *M. anderssoni*, Mich., and *M. bovei* (Rosa); the former is possibly synonymous with *M. aquarumdulcium* (see p. 274) and is an endemic; the latter has also been recorded from a large number of localities around Cape Horn. *Chilota dalei* (Bedd.), the fifth Falkland Islands endemic, did not occur in the present collections.

From Hermite Island, Cape Horn, five well-known acanthodriline species occurred in the present collection, all of them Patagonian, Chilean and Tierra del Fuegoan endemics of more or less restricted range. With the exception of the specimens of *Microscolex michaelsoni*, which appear to be referable to a new subspecies, there are no indications that these species from Hermite Island are in any way different from specimens of the corresponding species from the mainland or from adjacent islands.

A list of the species recorded from the present collections is appended below. A complete review of the earthworm fauna of the Neotropical Region as known up to the year 1905 is given by Cognetti¹; more recent contributions, when relevant, are discussed under the descriptions of the several species recorded in this communication.

LIST OF SPECIES

Family MEGASCOLECIDAE

Genus *Microscolex*, Rosa *em.* Mich.

M. falclandicus (Bedd.), Falkland Islands.

M. aquarumdulcium (Bedd.), Falkland Islands.

M. georgianus (Mich.).

f. *georgianus*, South Georgia;

f. *reductus*, nov., South Georgia.

M. michaelsoni, Bedd.

hermitensis, subsp.n., Hermite Island, Cape Horn.

Genus *Chilota*, Mich.

Ch. bicinctus (Bedd.), Hermite Island, Cape Horn.

Ch. patagonicus (Kinb.), Hermite Island, Cape Horn.

Genus *Yagansia*, Mich.

Y. gracilis (Bedd.), Hermite Island, Cape Horn.

Y. papillosus (Bedd.), Hermite Island, Cape Horn.

Genus *Dichogaster*, Bedd.

D. bolau (Mich.), var., Annobon.

Family LUMBRICIDAE

Genus *Eiseniella*, Mich.

E. tetraedra (Sav.).

f. *typica* (Sav.), Tristan da Cunha.

¹ Cognetti de Martiis, L., *Mem. R. Acc. Sci. Torino* (2), LX, 1905.

Genus *Eisenia*, Malm. *em.* Mich.

E. rosea (Sav.), Tristan da Cunha.

Genus *Allolobophora*, Eisen *em.* Rosa.

A. caliginosa (Sav.), Tristan da Cunha.

Genus *Dendrobaena*, Eisen *em.* Rosa.

D. subrubicunda (Eisen), Falkland Islands.

Genus *Bimastus*, Moore.

B. tenuis (Eisen), Falkland Islands, Tristan da Cunha.

Genus *Lumbricus*, L.

L. rubellus, Hoffm.

f. *tristani*, nov., Tristan da Cunha.

SYSTEMATIC

Family MEGASCOLECIDAE

Sub-family ACANTHODRILINAE

Sectio ACANTHODRILACEA

Genus *Microscolex*, Rosa *em.* Mich.

Microscolex falclandicus (Bedd.) (Fig. 1 *g-k*).

Acanthodrilus georgianus (part), Beddard, 1890, *Quart. Journ. Micr. Sci.*, N.S., xxx, 4, p. 421, pl. xxx, figs. 15, 16, 22, 30, 32-5.

A. falclandicus, Beddard, 1893, *Proc. Zool. Soc. London*, 1892, p. 678.

Notiodrilus falclandicus, Michaelsen, 1899, *Ergeb. Hamb. Magalh. Sammelr., Terricolen* (Nachtrag), p. 5. Hamburg.

Notiodrilus falclandicus, Michaelsen, 1900, *Das Tierreich*, x, *Oligochaeta*, p. 131.

Microscolex falclandicus, Michaelsen, 1905, *Wiss. Ergeb. d. Schwed. Südpolar-Exp.* 1901-3, *Oligochaeten*, v, 3, p. 10. Stockholm.

Teal Inlet, Falkland Islands, 5. iii. 27; six clitellate, ten non-clitellate semi-mature and immature specimens.

External characters. Length, clitellate specimens, 75-110 mm. Maximum diameter, clitellate specimens, $2\frac{3}{4}$ -4 mm. Colour unpigmented, pallid whitish or cream-coloured.

Prostomium epilobic with or without one or two transverse furrows, rather variable in extent. Clitellum, $\frac{2}{3}$ or $\frac{1}{2}$ 13-16 dorsally, extending laterally to setal line *a*, not complete ventrally as described for the type specimens. Copulatory papillae, variously placed paired or median ventrally on segments 16 or 17-20 or 21, sometimes small papillae near the spermathecal pores. Dorsal pores absent. Nephridial pores very slightly below setal line *c* on the anterior border of the segments, not directly in front of *c* as described for the types. Female pores paired, in front of and very slightly lateral to the ventral setae *aa*, on segment 14. Spermathecal pores at intersegments 7/8 and 8/9 in setal line *b*.

The other external characters are in essential agreement with those specified for the types.

Internal characters. Lateral hearts three pairs in segments 10–12, not five pairs in segments 9–13 as described for the types. Intestine apparently without trace of typhlosole. Nephridia with large terminal vesicles. Seminal vesicles two pairs in segments 11 and 12 as described for the types; the so-called median ventral seminal vesicle described by Beddard appears to be merely a thin-walled sub-oesophageal coelomic chamber. Ovisacs present, moderately large.

The prostates usually extend back through 3–5 segments; in one specimen the anterior prostates were very reduced and only occupied one segment. The duct is confined to the first prostatic segment and is moderately long and coiled; near the gland it is very thin, but the ectal half is thicker and muscular. The gland is thick, tubular and irregularly bent, occupying the remaining 2–4 prostatic segments.

The penial setal sac muscles originate from the body-wall of the segment in which they lie. Penial setae of two sorts, as originally described by Beddard. The dimensions of fully grown setae from both the *a* and *b* bundles are about the same (length *ca.* 1.5 mm., maximum diameter near the base *ca.* 38 μ , in middle of stem 27.5 μ , at distal end just below point where seta begins to taper abruptly *ca.* 11–12 μ). In both the stem is almost straight, and tapers to a filiform point. In the *a* setae the distal end is spirally curved through about 1–1½ revolutions, the direction of the spiral is the same as that of the ornamentation described below. In both setae the distal end of the stem is ornamented, but the type of ornamentation differs. In the *a* bundle (Fig. 1 *h, i*) the ornamentation begins with single, more or less regularly placed teeth around the stem, these give place to a spiral row of about thirteen scalloped knobs which pass up nearly to the point where the seta begins to taper and then stop abruptly; the distal extremity beyond this is ornamented with a few very fine teeth. The spiral line of knobs completes one extended revolution; in setae from the right side the spiral is clockwise, in setae from the left side it is anti-clockwise. In the *b* bundle (Fig. 1 *k*) the distal part of the stem, almost up to the point where the seta begins to taper, is ornamented with more or less regularly placed single or double teeth; these setae are presumably identical with the “smooth” type described by Beddard, since the *a* setae agree with his description and figure of the knobbed type. In Beddard’s figure the extreme distal end of both types of setae is shown to terminate in a round knob; in all specimens examined by me the distal end is filiform as described above. Such a knob was occasionally observed in the rather similar penial setae of the *b* bundle in *M. georgianns*. In a juvenile specimen the precursory penial setae (Fig. 1 *i, j*) were found to be more or less of the adult type but shorter, more slender and with less pronounced ornamentation.

The spermathecae are very similar to those of *M. georgianns* with two unstalked narrowly pear-shaped diverticula, and a somewhat larger pear-shaped ampulla passing gradually into a stout duct which receives the diverticula.

Paired septal organs occur, as described by Beddard, from about septum 23/24 backwards; they usually hang backwards into the segment behind, but may occasionally project forwards instead; the size is very variable.

The internal characters are otherwise in agreement with those specified for the types.

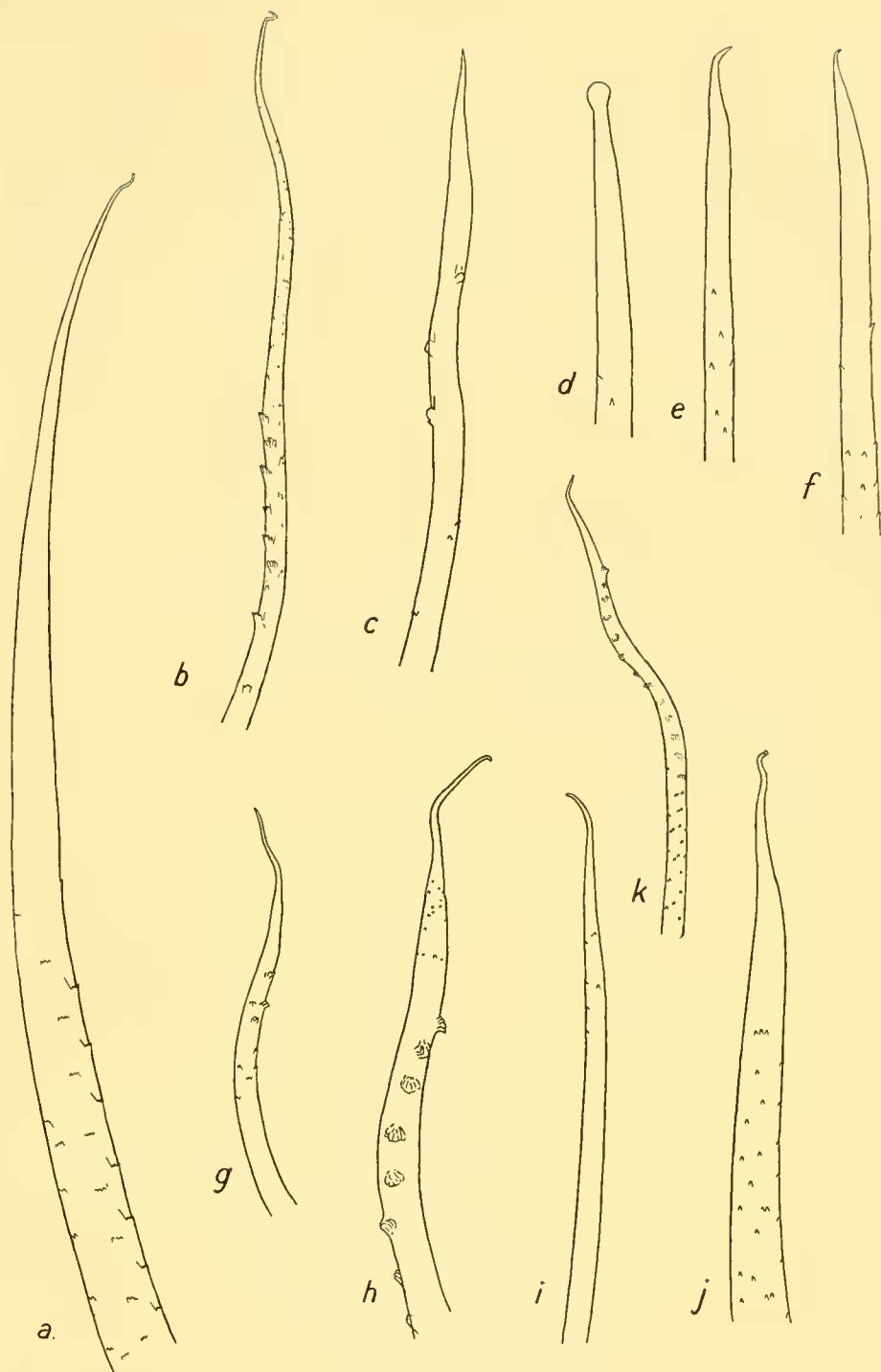


Fig. 1.

Microscolex aquarumdulcium (Bedd.). *a*. Distal end of a penial seta *b*, $\times 400$. *b*. Distal end of a penial seta *a*, $\times 400$.

Microscolex georgianus (Mich.). *c*. Distal end of a penial seta *a* from a right anterior bundle: the direction of the spiral formed by the three large scales is anti-clockwise, the greater part of the second scale lying on the under side of the seta in the figure, $\times 400$. *d*. Distal end of an abnormal penial seta *b*, $\times 400$. *e, f*. Distal ends of normal penial setae *b*, $\times 400$.

Microscolex falclandicus (Bedd.). *g*. Distal end of a precursory penial seta *a*, from a right anterior bundle, $\times 400$. *h*. Distal end of adult penial seta *a*, from a right posterior bundle; the direction of the spiral formed by the large knobbed scales is clockwise, the scales indicated by dots lie on the under side of the seta in the figure, $\times 150$. *i*. Extreme distal end of same seta, $\times 400$. *j*. Distal end of a precursory penial seta *b*, $\times 400$. *k*. Distal end of an adult penial seta *b*, $\times 400$.

Observations. In his original description Beddard referred this species to *Acanthodrilus georgianus* of Michaelsen. In the same year Michaelsen¹ re-described *A. georgianus* and pointed out that Beddard's specimens from the Falkland Islands differed in several respects from this species. Michaelsen suggested that Beddard's specimens were not *A. georgianus*, but were identical with *A. bovei* of Rosa. Beddard later (1893) accepted Michaelsen's first suggestion and referred these specimens to a new species, *A. falclandicus*. According to these authors *M. falclandicus* differs from *M. georgianus* in the following characters:

- (1) The intersetal distance *cd* is markedly greater than *ab*.
- (2) The nephridiopores are in setal line *c*, not slightly below it.
- (3) The gizzard is rudimentary, not absent.
- (4) The penial setae are different.

As regards the first character new material of *M. georgianus* described in the present investigation shows that the intersetal ratios are subject to great variation and may frequently be the same as in specimens of *M. falclandicus*. The nephridial pores of *M. falclandicus*, though never as markedly below the setal line *c* as in *M. georgianus*, are usually slightly so, and this character is therefore unreliable for diagnosis. The difference between a rudimentary gizzard and one which is "totally absent" is also very deceptive as a diagnostic character. The only character which can be relied on in the separation of these species is therefore that of the penial setae. Since the earlier descriptions were incomplete the penial setae of the two species are re-described and figured in the present communication. In both species the setae of the *a* and *b* bundles are of about the same dimensions, but differ in their ornamentation. The *b* setae of the two species are very similar; those of *M. georgianus* are shorter and slightly thinner, with ornamentation of the same type as in *M. falclandicus*, but the teeth fewer and further apart. It is in the *a* setae that the difference between the two species is most readily appreciated. As with the *b* setae, those of *M. georgianus* are shorter and somewhat more slender than those of *M. falclandicus*; in both species the distal end is slightly coiled through one revolution of a spiral and is ornamented with a spiral row of knobs; in *M. georgianus* these knobs are few in number (three or four), and either smooth or with a slightly serrated edge; in *M. falclandicus* there are a large number of knobs (*ca.* thirteen) and these are prominently scalloped; in *M. georgianus* the direction of the spiral is anti-clockwise on the right and clockwise on the left, in *M. falclandicus* the reverse is the case.

Both these species are also very close to *M. aquarumdulcium* and *M. anderssoni*, but may be distinguished by the form of the penial setae. In the two latter species (if they are not identical) the *a* setae are considerably more slender than the *b* and show no spiral ornamentation.

¹ Michaelsen, W., *Jahrb. d. Hamb. Wissensch. Anst.*, vii, 1889, p. 57.

Microscolex aquarumdulcium (Bedd.) (Fig. 1 *a*, *b*).

Acanthodrilus georgianus (part.), Beddard, 1890, *Quart. Journ. Micr. Sci.*, N.S., xxx, 4, p. 421.

A. aquarum-dulcium, Beddard, 1893, *Proc. Zool. Soc. London*, 1892, p. 680.

Notiodrilus aquarumdulcium, Michaelsen, 1899, *Ergeb. Hamb. Magalh. Sammelr.*, Terricolen (Nachtrag), p. 5. Hamburg.

N. aquarumdulcium, Michaelsen, 1900, *Das Tierreich*, x, *Oligochaeta*, p. 138.

Microscolex aquarumdulcium, Michaelsen, 1907, *Die Fauna Südwest-Australiens*, 1, 2, p. 143. Jena.

? *M. anderssoni*, Michaelsen, 1905, *Wiss. Ergeb. d. Schwed. Südpolar-Exp.* 1901-3, v, 3, p. 8. Stockholm.

Teal Inlet, Falkland Islands, 5. iii. 27; four clitellate and one immature specimen.

External characters. Length of clitellate specimens, 84-108 mm.; maximum diameter, 2-2.5 mm. Colour pallid, unpigmented.

Prostomium epilobic, with or without a transverse furrow. Clitellum $\frac{2}{3}$ 13-16 dorsally, extending laterally to setal line *a*. Copulatory papillae variously placed, paired or single, lateral or ventral papillae on segments 15-20; or at the intersegments in this region. Dorsal pores absent. Nephridial pores in or very slightly below setal line *c* on the anterior borders of the segments. Spermathecal pores, two pairs at intersegments 7/8 and 8/9 in setal line *b*. Female pores, one pair on segment 14, in front of and very slightly external to the ventral setae (*aa*) on each side. Prostatic pores, two pairs on segments 17 and 19, on small papillae situated at the ends of the seminal grooves somewhat external to setal line *b* on each side. Male pores, one pair on segment 18, just external to seta *b* on each side and lying in the seminal grooves. Seminal grooves straight and very deep, between swollen walls. Intersetal distances, *aa* : *ab* : *bc* : *cd* : *dd* = at the anterior end, approximately $1\frac{1}{2} : 1 : 1\frac{1}{6} : 1\frac{1}{4} : 2\frac{1}{2}$, *dd* = $\frac{2}{9} u$; at the posterior end, $1\frac{1}{3} : 1 : 1\frac{1}{4} : 1\frac{1}{3} : 2$, *dd* = $\frac{2}{9} u$.

Internal characters. Gizzard very reduced, in segment 5. Salivary glands extend back dorsally into segment 6 or 7. Intestine commences in segment 16; typhlosole absent. Lateral hearts, three pairs in segments 10-12. Nephridia with large terminal vesicles. Septal organs present as in *M. falclaudicus*, from about septum 24/25 on, sometimes very reduced and sometimes projecting forwards instead of backwards. Testes and spermiducal funnels, two pairs, free, in segments 10 and 11. Seminal vesicles, two pairs in segments 11 and 12, depending from septa 10/11 and 11/12 respectively, lobulate. Ovaries, one pair in segment 13, fan-shaped, many-fingered. Ovisacs present in segment 14 from septum 13/14.

Prostates occupying 6 to 9 segments each, of which the duct usually occupies the first two, occasionally only the first. The gland is more or less straight or irregularly bent; near the gland the first third of the duct is thin and coiled once or twice; the remaining two-thirds of the duct is thick, muscular, and curved in the form of a semicircle. There are normally two pairs of well-developed prostates; in one specimen the left anterior prostate is very much reduced, and penial or ventral sigmoid setae are missing. In a

second specimen on the right side the posterior prostate is very reduced and confined to one segment, and the short gland is doubled back on the duct. The penial setal sac muscles originate from the body-wall of segment 19 near the posterior septum and the bundles of setae lie irregularly, the *b* bundle twisted in front of the *a* and pointing up instead of downwards. On the left side a similar condition prevails except that the prostate is apparently entirely absent. The penial setae are apparently normal.

Penial setal sac muscles originate, in part, from the body wall of the segment in which they lie, and in part fibres pass back with the prostatic gland and appear to enter the last septum through which the gland passes. Penial setae of two sorts, those of the *a* bundle more slender than those of the *b*. In the *a* setae the stem is straight except for the distal fourth which is strongly curved; the full-grown seta is about 1.5 mm. long and tapers very gradually to a filiform point. The distal end is ornamented on the inner side of the curvature with large, projecting, irregularly placed, serrate scales; these stop abruptly, and the tapering region beyond is ornamented with very fine, irregularly placed, simple or serrate teeth (Fig. 1 *b*); in the middle of the stem the diameter is from 12 to 14 μ . In the *b* setae the stem is straight except at the distal end, which is slightly curved and tapers gradually to a filiform point; in this region the seta is quite smooth, but lower down it is ornamented at the distal end with alternating, serrate scales (Fig. 1 *a*); a full-grown seta is about 1.5 mm. long and in the middle region of the stem about 21.5 μ in diameter.

Spermathecae, two pairs in segments 8 and 9, similar to those of *M. falclandicus* and *M. georgianus*.

Observations. Beddard's original description of *M. aquarumdulcium* is very inadequate, but it is probable that the specimens discussed above are correctly referred to this species. As stated by Beddard for the types of *M. aquarumdulcium*, these specimens are very similar to *M. falclandicus*, but more slender, and the body wall is thinner. Unlike the types these specimens are not smaller, but of about the same length as specimens of *M. falclandicus*; this character is of doubtful significance. Beddard evidently only observed the penial setae of the *b* bundle which he describes. In stating that the large tubercles of *M. falclandicus* are entirely absent he was in error, since the projecting serrate teeth of the *a* setae are not unlike those of the latter species.

This species is also in close agreement with *M. anderssoni* Mich. The prostatic duct is not in any sense of the word short as described for *M. anderssoni*, and the ornamentation of the penial setae seems to be somewhat different. It is quite possible that these differences are not significant and that the two species should be synonymized.

M. aquarumdulcium cannot be distinguished from *M. falclandicus* with any certainty on external characters. It is undoubtedly more slender and owing to the greater thinness of the body-wall the more extensive prostates can as a rule be seen from the outside. On internal characters it is chiefly distinguished by the greater extent of the prostates and by the form of the penial setae.

Microscolex georgianus, f. **georgianus** (Mich.) (Figs. 1 c-f, 3a).

Acanthodrilus georgianus, Michaelsen, 1888, *Jahrb. d. Hamb. Wissensch. Anst.*, v, 1887, p. 68, pl. 2, fig. 4 a-d.

Mandane georgiana, Michaelsen, 1889, *ibid.*, vi, 1888, p. 61.

Acanthodrilus georgianus, Michaelsen, 1890, *ibid.*, vii, 1889, p. 57.

Notiodrilus georgianus, Michaelsen, 1899, *Zool. Jahrb., Syst.*, xii, p. 239.

N. georgianus, Michaelsen, 1900, *Das Tierreich*, x, *Oligochaeta*, p. 130.

Microscolex (Notiodrilus) georgianus, Michaelsen, 1905, *Deutsch. Südpolar-Exp. 1901-3, Oligochaeten*, ix, Zool., 1, p. 54.

Microscolex georgianus, Michaelsen, 1905, *Wiss. Ergeb. d. Schwed. Südpolar-Exp. 1901-3*, v, 3, p. 11. Stockholm.

uec Acanthodrilus georgianus, Beddard, 1890, *Quart. Journ. Micr. Sci.*, N.S., xxx, 4, p. 421.

In earth half-way between Cairn and Maiviken, St. MS 70, South Georgia, 4. iii. 26; three clitellate and three non-clitellate semi-mature specimens. In wet moss 200 ft. above Upper Lake, St. 122, South Georgia, 14. xii. 26; four fully or partly clitellate and six non-clitellate semi-mature or immature specimens. Under stones near Upper Lake, St. 122, South Georgia, 14. xii. 26; five fully or partly clitellate, seven non-clitellate semi-mature and one immature specimen, one damaged anterior end and two posterior ends. Moss and *Acaena*, Larsen Harbour, South Georgia, 6. i. 27; seven clitellate and one immature specimen. River bank, Wilson Harbour, South Georgia, St. WS 62, 19. i. 27; fourteen clitellate, seven non-clitellate semi-mature and one immature specimen, and four fragments. From river bank, Undine Bay, South Georgia, St. 65, 22. i. 27; eighteen fully or partly clitellate specimens. Cumberland Bay, South Georgia, no date; twenty clitellate and semi-mature, nine immature specimens, in very poor preservation.

External characters. Length rather variable, 31-80 mm. Colour: usually tinged with reddish pigment dorsally at the anterior end, frequently very faint or absent, occasionally moderately deep.

Prostomium epilobic, with or without a cross-furrow; the extent of the tongue is very variable, in some specimens being almost tanylobic. Clitellum $\frac{1}{n} 13 - \frac{1}{n} 16$, usually extending laterally to about setal line *a*; in a few specimens the line of demarcation is indefinite and the clitellum appears to extend ventrally on to segments 14 and 15. Copulatory papillae very variable, occasionally absent, frequently paired or single on one or other side on posterior border of segment 10 in the line of the ventral pair of setae; papillae are usually present, ventrally or laterally, in the region of segments 16-19, variously disposed either on the borders of the segments or across the intersegments. Dorsal pores absent. Nephridial pores about $\frac{1}{3} bc$ below setal line *c* on the anterior borders of the segments. Spermathecal pores, two pairs in setal line *b* at intersegments 7/8 and 8/9, either on conspicuous papillae or inconspicuous; this is apparently not correlated with the degree of maturity. Female pores one pair on segment 14 in front of seta *a* on each side. Intersetal ratios very variable; in some specimens *cd* may be about equal to *ab* as described for the types, but more usually *cd* is greater than *ab*. In general the ratios are more or less similar to those of *M. falclaudicus*; this character is in any case too variable to be relied on in distinguishing the two species.

The other external characters are essentially as described for the type.

Internal characters. Gizzard absent. The salivary glands extend back dorsally over the pharynx into segment 6, 7 or 8. Intestine commences in segment 16, typhlosole absent. Lateral hearts, three pairs in segments 10–12. Nephridia with large terminal vesicles. Seminal vesicles, two pairs in segments 11 and 12. Ovisacs present or absent, occasionally present on one side only. Septal organs apparently absent.

Prostates, two pairs opening in segments 17 and 19 respectively. The duct is confined to the segment of the external opening; near the gland it is thin and coiled once or twice, near the external opening it is thicker, muscular and curved, but not coiled. The gland occupies 2–4 segments behind that in which the duct lies; it is thick, tubular, and irregularly twisted. Penial setal sac muscles originate from the body-wall of the segment to which they belong.

The penial setae of the *a* and *b* bundles are dissimilar. In all the adult specimens examined the penial setae appear to belong to the reserve bundle, in spite of the fact that the specimens were fully clitellate. All the dated collections were made in the summer months from December to January (one is undated), and the absence of full-grown functional setae would be explicable if this period were after or at the end of the breeding season. Without further collections at other times of the year it is impossible to decide on this point. In the reserve bundles the largest setae are apparently practically full grown and the measurements given below refer to such setae. Setae of the *b* bundle are from 0.45 to 0.6 mm. long, about 23μ in diameter at the base, 17 narrowing to 14μ in the middle of the stem and about 9μ at the distal end just below where the seta begins to taper rapidly. The stem is practically straight, tapering very gradually from the base nearly to the distal end and then tapering rapidly to a filiform point. In a few cases the distal end terminates in a rounded, more or less flattened knob (Fig. 1 *d*), apparently the result of a deformity. The distal end of the stem is ornamented with a few scattered single teeth (Fig. 1 *e, f*). In setae of the *a* bundle the length varies from 0.43 to 0.57 mm., the stem is straight except at the distal end and the diameter in the various regions is about the same as in setae of the *b* bundle. The distal end of the *a* setae is spirally coiled through not more than one revolution; the direction of the spiral is the same as that of the ornamentation described below, but the coiling is not very well marked. At the extreme distal end the seta tapers abruptly to a filiform point as in setae of the *b* bundle. The ornamentation (Fig. 1 *c*) commences just below the region of spiral curvature with a few irregularly placed single teeth; this is succeeded by a row of three or four large knobs which follow a spiral line round the stem. In setae from the right side the direction of the spiral is anti-clockwise, from the left side clockwise; this is the opposite of the condition in *M. falclandicus*. The knobs are either smooth or serrated along the edge, never markedly scalloped as in *M. falclandicus*. Michaelsen, in his original description, appears to have mistaken the relatively smooth setae of the *b* bundle for reserve setae.

Spermathecae two pairs in segments 8 and 9, similar to those of *M. falclandicus* and *M. aquarumdulcium*. The pear-shaped ampulla is not sharply separated from a short, stout duct, which receives two unstalked simple diverticula near the ampulla

(Fig. 3 a). The remaining internal characters are essentially as described for the type specimens.

Abnormal specimens. Two abnormal specimens were encountered in the collections of *M. georgianus*. Since such abnormalities are of frequent occurrence in *Oligochaetes* and have been made the subject of special study by various authors (the literature is reviewed by Stephenson¹), it is only desirable here to indicate the main external features of these specimens.

In a clitellate specimen from Larsen Harbour, 6. i. 27, the left side of the animal is entirely normal but the right shows several abnormalities. Segment 9 is divided by a furrow on the right side, and there are three spermathecal pores beginning at intersegment 8/9. The right female pore is on segment 15 instead of 14. Segment 18 is also divided by a furrow on the right side, and there are three prostatic pores on segments 18, 20 and 21. There is no seminal groove in connection with the first of these; from the second a groove extends half a segment forward and from the third half a segment backwards. No male pore or pores can be seen externally on the right side. The clitellum is also peculiar on the right side, extending over segments 14-17 continuously, absent on 18, and recurring again on segment 19.

In a poorly preserved specimen from Wilson Harbour, 19. i. 27, an even more abnormal condition is found. Segments 1-3 appear to be normal, segments 4-7 are so subdivided by spiral furrows as to be quite confused. There are three pairs of spermathecal pores immediately behind this region. If the first spermathecal pore is assumed to be at intersegment 7/8, then the next two are at intersegments 9/10 and 10/11 respectively. The clitellum is apparently normally situated in reference to this region, on segments 14-16, but it is poorly defined and owing to bad preservation the female pores are not visible. The prostatic pores are situated very far back and are abnormally arranged. On segment 26 (on the assumption previously indicated) there is a pair of prostatic pores; on 27 a second prostatic pore on the right and a male pore on the left; on 28 a prostatic pore on the left and a male pore on the right; on 29 what appears to be an additional male pore on the left and a third prostatic pore on the right; on 30 apparently a small pair of prostatic pores. Either serial sections or careful dissection would be necessary to confirm these statements, but owing to the poor state of preservation no such examination has been attempted.

Observations. This species is exceedingly close both to *M. falclandicus* and to *M. aquarumdulcium* from the Falkland Islands. The differences separating these species are discussed under *M. falclandicus*.

f. *reductus*, nov.

In wet moss 200 ft. above Upper Lake, St. 122, South Georgia, 14. xii. 26; one fully, one partly clitellate and one non-clitellate semi-mature specimen (*type* and *paratypes*).

These specimens only differ from the typical form in the absence of the posterior pair of prostates and penial setae; they are in essential agreement with f. *georgianus* in all

¹ Stephenson, J., *The Oligochaeta*, Oxford, 1931.

other characters specified in the present and in previous descriptions of the species. It is remarkable that microscolepine reduction of the prostates should have occurred without involving any other characters, even the posterior pair of spermathecae being normally developed.

Length 37–40 mm. Colour slightly pigmented greyish brown dorsally and ventrally at the anterior end. Prostomium schizo-epilobic. Clitellum 13–16; in the fully clitellate specimen the clitellum is complete but much less swollen ventrally. Copulatory papillae absent in two specimens; in the fully clitellate specimen there is a papilla on segment 16 on the right side on the posterior border in setal line *a*, also swollen areas without definite papillae ventrally on segments 16–18.

Microscolex michaelsoni, Bedd., *hermitensis*, subsp.n. (Fig. 2 *a*, *b*).

St. 222, St Martin's Cove, Hermite Island, Cape Horn, 23. iv. 27, under logs and stones; three mature specimens in very poor preservation (*cotypes*).

Length (two uninjured specimens) 73 and 75 mm. Colour very slightly tinged with red-brown pigment dorsally at the anterior end.

Clitellum saddle-shaped, from about 14–16. Copulatory papillae apparently absent, but the state of preservation does not permit certainty. Dorsal pores absent. Intersetal ratios, *aa* : *ab* : *bc* : *cd* : *dd*, at anterior end approximately 1.5 : 1 : 1.5 : 1.5 : 2, *dd* = *ca*. $\frac{1}{5}u$; at posterior end, approximately, $1\frac{1}{4}$: 1 : 1 : 1 : 2, *dd* = *ca*. $\frac{2}{9}u$.

The gizzard, as far as the state of preservation allows determination, appears to be quite absent. Salivary glands extend into segment 7 dorsally over the pharynx. Testes and spermiducal funnels, only one pair, in segment 10; there was no trace of a rudimentary second pair in 11 in any of the three specimens.

Prostates occupying 3–5 segments each. The duct is long and somewhat coiled, thicker near the external opening, thinner near the gland, from which it is sharply separated. The duct occupies the first or first and second segments, the short, coiled, tubular gland the remaining two or three segments.

Penial setal sac muscles originate from the body wall at the first intersegment behind their respective prostatic pores.

Penial setae in two dissimilar sub-bundles. The setae of the two bundles are of approximately the same length (0.9–1.6 mm.) but those of the *a* bundle are more slender than those of the *b* in any given specimen, although the range in diameter actually overlaps (diameter near base, *a* ca. 20 μ , *b* 18.5–21.5 μ ; in middle of stem, *a* 11–14 μ , *b* 14–20 μ). In general form the setae are as figured by Michaelson for the types¹; the setae of the *a* bundle taper very gradually, of the *b* bundle more rapidly to a filiform point. The setae of the *a* bundle agree with Michaelson's more slender type in being ornamented at the distal end on the inner side of the curvature with prominent serrate teeth, the tapering point beyond the region of large teeth being ornamented with a few small irregular teeth or markings (Fig. 2 *b*). The setae of the *b* bundle differ from

¹ 1911. Michaelson, W., *Zool. Jahrb., Abt. f. Syst.*, xxx, p. 567, pl. 15, figs. 10 and 11.

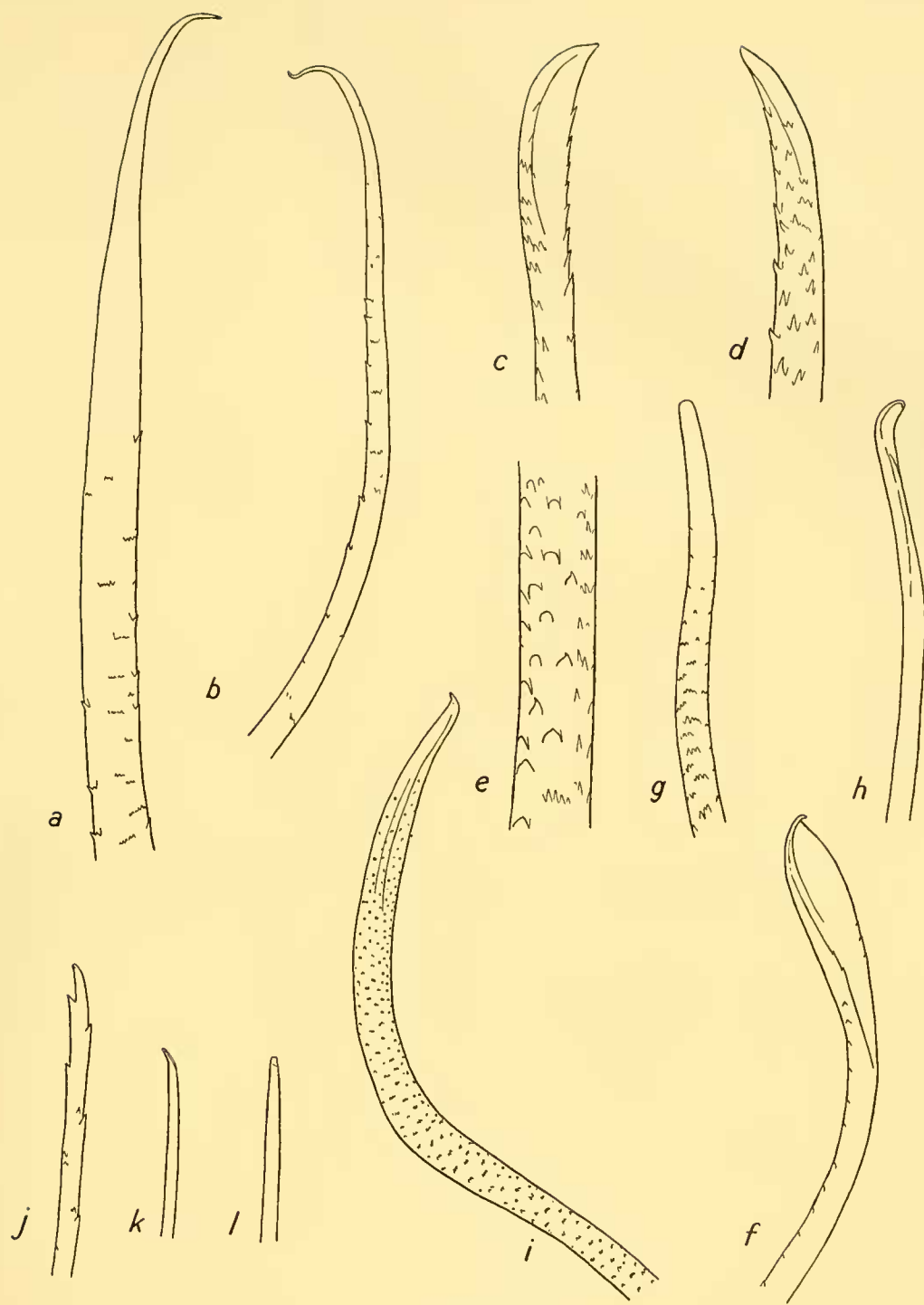


Fig. 2.

Microscolex michaelseni hermitensis subsp.n. a. Distal end of penial seta *b* of a cotype, $\times 400$. b. Distal end of a penial seta *a* of a cotype, $\times 400$.

Chilota bicinctus (Bedd.). c. Extreme distal end of a penial seta *b*, $\times 400$. d. Extreme distal end of a penial seta *a*, $\times 400$. e. Part of ornamented region of stem towards distal end of a penial seta *a*, $\times 400$.

Chilota patagonicus (Kinb.). f. Distal end of a penial seta *a*, $\times 400$.

Yagansia papillosus (Bedd.). g. Distal end of a penial seta *b*, $\times 400$. h. Distal end of a penial seta *a*, $\times 400$.

Yagansia gracilis (Bedd.). i. Distal end of a penial seta, $\times 150$.

Dichogaster bolau (Mich.). j. Distal end of a penial seta *a*, $\times 400$. k. Distal end of a penial seta *b*, side view, $\times 400$. l. Distal end of the same penial seta, face view, $\times 400$.

those described by Michaelsen in being ornamented distally all round the stem with sparse serrated teeth or scales (Fig. 2 *a*). Since these stouter setae are definitely stated to be quite smooth, it would appear that these specimens differ from the types in this character.

In all other characters, both external and internal, these specimens are in essential agreement with the types of *M. michaelsoni*.

Observations. Apart from the possibility that the types are really unpigmented and not merely faded these specimens only differ in the ornamentation of the penial setae of the outer sub-bundle. If these specimens constitute a race peculiar to Hermite Island they should be treated as a subspecies, but it is equally probable that they merely represent a variety not geographically separated from the type. In the absence of evidence to the contrary they have been treated above as representing a distinct subspecies.

Sectio CHILOTACEA

Genus *Chilota*, Mich.

Chilota bicinctus (Bedd.) (Fig. 2 *c-e*).

Acanthodrilus bicinctus + *A. purpureus*, Beddard, 1895, *Proc. Zool. Soc. London*, 1895, pp. 217, 218.

A. bicinctus + *A. dalei* (part), Beddard, 1896, *Ergeb. Hamb. Magalh. Sammelr., Naid. Tubif. Terric.*, p. 27, figs. 10 and 12, pp. 28 and 39.

A. purpureus, Michaelsen, 1898, *Zool. Jahrb.*, suppl. 4, p. 471.

Chilota bicincta, Michaelsen, 1899, *Ergeb. Hamb. Magalh. Sammelr., Terricoleu* (Nachtrag), p. 17. Hamburg.

Ch. bicincta, Michaelsen, 1900, *Das Tierreich*, x, *Oligochaeta*, p. 148.

Ch. bicinctus, Michaelsen, 1923, *Göteborg. Vetensk-Samh. Handl.* (4), xxvii, Afd. 32, p. 4.

St. 222, St Martin's Cove, Hermite Island, Cape Horn, 23. iv. 27; three clitellate and one immature specimen, also three very immature specimens probably referable to this species; in rather poor preservation.

Length (two uninjured, clitellate specimens) 74 and 77 mm.

Clitellum, $\frac{1}{2}$ 13-16, or $\frac{1}{2}$ 17 dorsally, 14-16 ventrally. Copulatory papillae apparently absent, but state of preservation does not permit certainty on this point. Dorsal pores absent. Nephridial pores in setal line *c*, difficult to see. Spermathecal pores, two pairs, at intersegments 7/8 and 8/9 on papillae in setal line *b*. Prostatic pores, two pairs, on segments 17 and 19 in setal line *b* on papillae.

Gizzard in segment 5, small but muscular. Not in segment 7 as described for the types of "*Ac. purpureus*" by Beddard (the condition in the types of *Ac. bicinctus* is not mentioned). Salivary glands extend into segment 5. Intestine: the position of the first intestinal segment is apparently very variable; in one clitellate specimen it appeared to be in 19, in another in 20, and in the third in 23; in the immature specimen the state of preservation rendered it impossible to determine this point. Typhlosole absent. Lateral hearts: last pair in segment 12 as described for the type of "*Ac. purpureus*" but not specified for the types of *Ac. bicinctus*.

Nephridia: the terminal section of the duct proximal to the external pore is considerably dilated but does not form a large vesicle as for instance in *Ch. patagonica*; before entering the body-wall the duct is constricted again. Owing to poor preservation it is not possible to describe the condition more accurately. Seminal vesicles, two pairs, in segments 9 and 11, not one pair in segment 11 as described by Beddard for the types; the anterior pair is, however, very reduced and finely lobulate. Ovisacs present, in one specimen apparently on the left side only.

Prostates occupying five segments of which the first contains the moderately long, thin and sinuous duct. In one specimen both prostates are missing on the right side, and normal ventral sigmoid setae are present instead of penial setae.

Penial setal sac muscles pass backwards beside the prostatic glands and originate from the body-wall at the fourth intersegment behind their respective prostatic pores. Penial setae in two dissimilar sub-bundles, approximately as described and figured by Beddard. Setae of the *b* bundle are long and thin (3.3–3.4 mm. long, diameter near base *ca.* 34 μ , in middle region of the stem very irregular *ca.* 20–23 μ , at the distal end below the blade 11–12.5 μ , breadth of blade 17–20 μ , thickness *ca.* 4.5 μ). About the distal two-fifths of the stem is ornamented with long, slender teeth, in groups of two or three or in longer rows, rarely singly; these are chiefly on the lateral and convex sides, not on the inner side of the curvature. On the blade the ornamentation continues on the convex side, but the concave side is smooth, and the sides of the blade are toothed. Contrary to Michaelsen's re-description the teeth just below the blade are not conspicuously stouter than the rest. The point of the blade is not as blunt as in Beddard's figure for that of a type (Fig. 2 *c*). The setae of the *a* bundle are somewhat stouter and only about half as long as those of the *b* bundle; the tip is slightly flattened, but not broadened, to form a scarcely differentiated blade which terminates in a blunt point (length *ca.* 1.8 mm., diameter near base 41–49 μ , in middle region of stem 26–29 μ , tapering at distal end to 15–17 μ below the flattened tip, breadth of blade *ca.* 15.5 μ , thickness *ca.* 6 μ); distal third of stem ornamented on the concave side of the curvature with large blunt scales, or more distally with large pointed scales; on the convex side with slender pointed teeth, either singly or in rows of two, three or more (Fig. 2 *d, e*).

Spermathecae: the sperm chamber at the end of the long, thick stalk of the diverticulum is apparently only divided into a few rather large chambers, and does not consist of numerous chambers forming a mulberry-like head as described by Michaelsen (1923). This appearance may be merely the result of poor preservation and is, in any case, probably not a significant difference.

In other characters, both external and internal, as far as could be determined, these specimens are essentially in agreement with the types.

Observations. Except for the presence of seminal vesicles in segment 9 and the position of the gizzard in segment 5 instead of 7 these specimens agree very well with the descriptions of *Ch. bicinctus*. The possibility that Beddard was mistaken in both these observations cannot be overlooked, since the anterior seminal vesicles are very reduced and the position of the gizzard is always difficult to determine. Only a re-examination

of the types can confirm the identification of these specimens with *Ch. bicinctus*, but until this has been done it is not desirable to separate the former as representing a distinct species.

Chilota patagonicus (Kinb.) (Fig. 2 *f*).

For complete synonymy and bibliography up to 1900, see:

Chilota patagonica, Michaelsen, 1900, *Das Tierreich*, x, *Oligochaeta*, p. 155.

St. 222, St Martin's Cove, Hermite Island, Cape Horn, 23. iv. 27, under logs and stones; one immature specimen.

Nephridial pores very slightly below setal line *c*. Gizzard entirely in segment 5, not in 5 and 6 as stated for the type. Salivary glands stop at septum 4/5. Intestine widens in segment 16. Dorsal blood vessel single as in the smaller specimens described by Michaelsen¹, not double as in the typical specimens. Nephridia with well-developed terminal vesicles. Ovisacs apparently absent.

Prostates as coiled tubular glands confined to the segment in which they open to the exterior, the duct moderately short and thin, somewhat coiled. The posterior pair of prostates smaller than the anterior, as described by Michaelsen².

Penial setal sac muscles originate from the body-wall at the first intersegment behind their prostatic pore. Penial setae: those of the *a* and *b* bundles alike, essentially as described by Michaelsen. The dimensions are somewhat less than in the types (length 1.7–1.8 mm., diameter in mid-region of stem 19–23 μ , just below blade 11–15 μ), but since the specimen is immature this is not significant. At the extreme distal end below the blade the ornamentation is in the form of single teeth confined to the inner side of the curvature (Fig. 2 *f*); below this the ornamentation is in the form of rows or part rings of teeth and occurs on both sides of the stem.

Spermathecae: the anterior pair are smaller than the posterior. In other characters, as far as its degree of development permits determination, this specimen is in essential agreement with those specified for the type.

Genus *Yagansia*, Mich.

Yagansia gracilis (Bedd.) (Figs. 2 *i*, 3 *c*, *d*).

Microscolex gracilis, Beddard, 1895, *Proc. Zool. Soc. London*, 1895, p. 234.

Microscolex gracilis, Beddard, 1896, *Ergeb. Hamb. Magalh. Sammelr.*, *Naid. Tubif. Terric.*, p. 54.

Yagansia gracilis, Michaelsen, 1899, *ibid.*, *Terricolen* (Nachtrag), p. 22. Hamburg.

Yagansia gracilis, Michaelsen, 1900, *Das Tierreich*, x, *Oligochaeta*, p. 160.

St. 222, St Martin's Cove, Hermite Island, Cape Horn, 400 ft. alt., 24. iv. 27; one clitellate specimen.

Length, 75 mm. Colour unpigmented, not dark purple as described by Beddard for the types. This may well be the result of fading, as has been discussed by Michaelsen (1899) for other specimens of this species.

¹ Michaelsen, W., *Zool. Jahrb.*, Suppl. 4, p. 472.

² *Id.*, *Jahrb. d. Hamb. Wissensch. Anst.*, vi, Zweite Hälfte (*Mitt. Mus. Hamb.*), p. 61.

Prostomium epilobic $\frac{1}{2}$. Clitellum $\frac{2}{3}$ 13- $\frac{2}{3}$ 16, complete ventrally. Copulatory papillae absent. Dorsal pores present from intersegment 8/9 backwards, except in the clitellar region where pores are apparently absent. Nephridial pores on the anterior

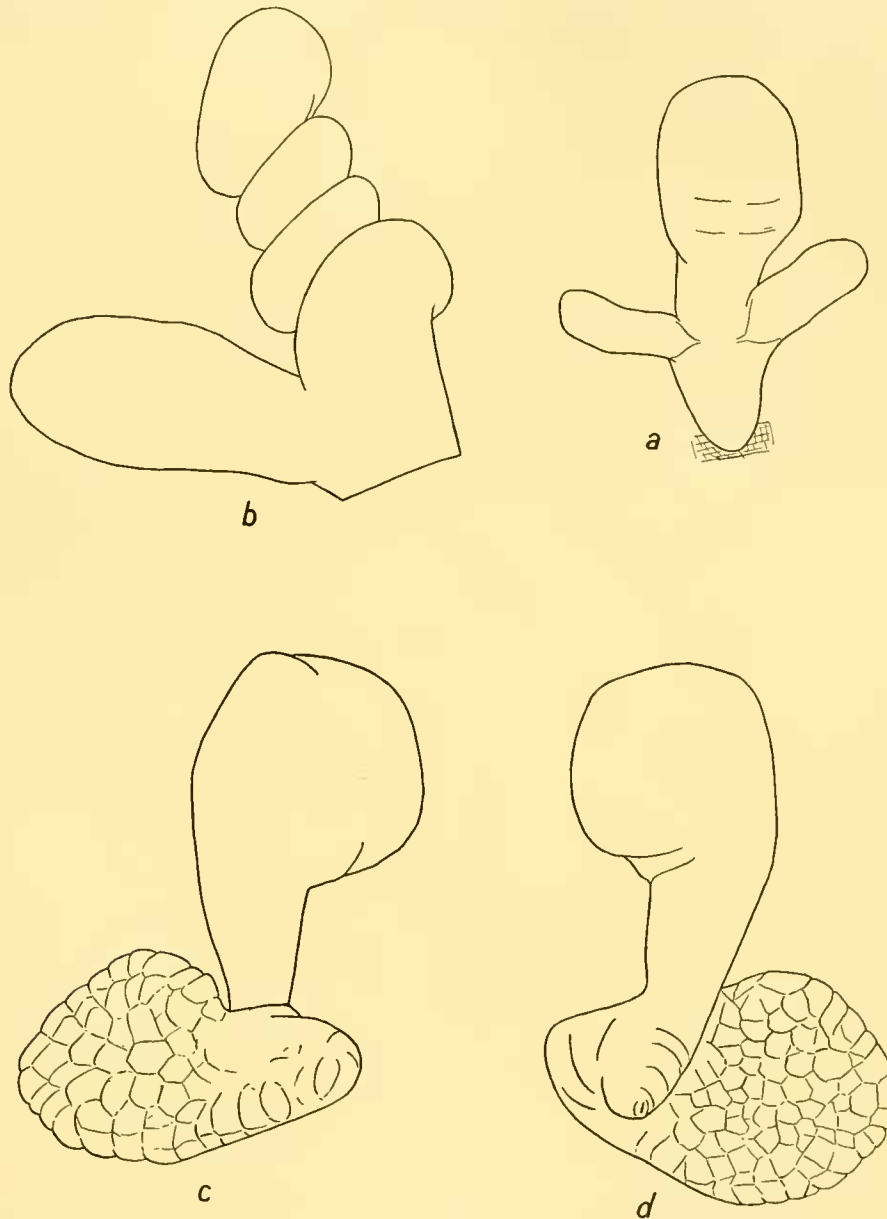


Fig. 3.

Microscolex georgianus (Mich.). *a.* Spermatheca, anterior view, $\times 40$.

Yagansia papillosus (Bedd.). *b.* Left spermatheca, anterior view; the diverticulum is spirally coiled in a clockwise direction, $\times 40$.

Yagansia gracilis (Bedd.). *c.* Right spermatheca, anterior view, $\times 40$. *d.* The same spermatheca, posterior view, $\times 40$.

borders of the segments, in or very slightly below setal line *c*. Female pores on segment 14, anterior and internal to the ventral setae (*aa*). Intersetal ratios: *aa* : *ab* : *bc* : *cd* : *dd* on segment 10 about 2 : 1 : 2 : $1\frac{2}{3}$: 5, *dd* = *ca*. $\frac{1}{3}u$; at posterior end, about $1\frac{1}{3}$: 1 : $1\frac{1}{2}$: 1 : $1\frac{2}{3}$, *dd* = *ca*. $\frac{1}{5}u$.

Gizzard large, cylindrical, in segment 6, not in segment 8 as described by Beddard for the types of this species. Salivary glands extend into segment 5. Intestine widens rather gradually from segment 17. Typhlosole absent. Lateral hearts, last pair in segment 12. Nephridia: the wide tube is L-shaped and the short limb of the L near the external opening is dilated to form a terminal vesicle. Ovaries very large, as originally described by Beddard. Ovisacs absent.

Seminal vesicles comprise two unusually small pairs in segments 9 and 11 respectively, not one pair in segment 11 as described for the types. Prostates occupying four segments each; the gland thick, tubular and coiled in one plane, beginning in the first prostatic segment; duct confined to the first prostatic segment, very thin, moderately long and coiled, sharply separated from the gland.

Penial setal sac muscles originate from the body-wall at the third intersegment behind the prostatic pores. Penial setae in two similar sub-bundles; the form of the seta is essentially in agreement with Beddard's description for the types. The ornamentation is as later described by Michaelsen (l. c.), except that the fine rows of teeth are not confined to the convex side of the curvature at the distal end but occur on both sides (Fig. 2 *i*). Below the flattened blade the setal stem is thickened. Dimensions, length *ca.* 2 mm.; diameter near base 31μ (*b*), *ca.* 42μ (*a*); in middle of stem $26-27\mu$ (*b*), $28-29\mu$ (*a*), in thickened region below blade $31-32\mu$ (*a*), 35μ (*b*); thickness of blade 15.5μ narrowing to 7.5μ for both setae, breadth of blade *ca.* 34μ (only an *a* measured in face view).

Spermathecae as described for the types (Fig. 3 *c, d*).

In other characters essentially in agreement with previous descriptions.

Observations. This species is exceedingly close to *Y. diversicolor* (Bedd.) from which it was distinguished by Beddard by the form of the prostomium. The present specimen agrees with the description of *Y. diversicolor*, and differs from *Y. gracilis* in the position of the gizzard and in the presence of seminal vesicles in segment 9; the prostomium is, however, epilobic. Michaelsen expressly states that the penial setae of the two species are identical and in view of this it seems probable that these species are really synonymous or at any rate merely represent forms or subspecies. In the absence of further evidence the present specimen is referred to *Y. gracilis*, which has priority.

Yagansia papillosus (Bedd.) (Figs. 2 *g, h, 3 b*).

Microscolex papillosus, Beddard, 1895, *Proc. Zool. Soc. London*, 1895, p. 230.

Microscolex papillosus, Beddard, 1896, *Ergeb. Hamb. Magalh. Sammelr., Naid. Tubif. Terric.*, p. 50, figs. 1-4. Hamburg.

Yagansia papillosa, Michaelsen, 1899, *ibid.*, *Terricolen* (Nachtrag), p. 23.

Y. papillosa, Michaelsen, 1900, *Das Tierreich*, x, *Oligochaeta*, p. 161.

St. 222, St Martin's Cove, Hermite Island, Cape Horn, 23. iv. 27, under logs and stones; one clitellate specimen, in poor preservation.

Colour slightly pigmented dorsally at the anterior end. Prostomium epilobic. Clitellum extends over about 13-16, saddle-shaped, extending laterally to setal line *b*.

Copulatory papillae apparently absent. Dorsal pores absent. Gizzard small, cylindrical, muscular, in segment 5. Salivary glands stop at septum 4/5. Intestine widens from the oesophagus in segment 18, not in 17 as described by Beddard for a type specimen. This character is probably variable, as in the three specimens of *Microscolex michaelsoni hermitensis* described above. Typhlosole absent. Lateral hearts, last pair in segment 11. Nephridia with small pear-shaped terminal vesicles. Ovisacs present.

Prostates occupying eight segments each, of which the duct is confined to the first two. Duct straight and half as thick as the gland; gland moderately thin, tubular, straight (not coiled as described by Beddard for a type specimen), sharply separated from the duct.

Penial setal sac muscles originate from the body-wall at, or at about (the state of preservation leaves this character in some uncertainty) the 16th intersegment behind their respective prostatic pores, i.e. at about intersegment 33/34. Penial setae: Beddard originally described the penial setae as of two sorts, one fully twice as long as the other, but otherwise alike and unornamented. Michaelson later re-described the penial setae but did not mention the question of dimorphism; he described them as ornamented, but was unable to observe this in some specimens (from Punta Arenas, South Patagonia). In the present specimen the setae of the two sub-bundles are dissimilar; those of the *a* bundle are three times as long as those of the *b* bundle and are apparently smooth, while those of the *b* bundle are ornamented. Penial setae of the *a* bundle are strongly curved when removed, but apparently lie straight in the setal sac; approximately the distal half is somewhat flattened and broadened so as to appear strap-like when turned about, the extreme distal end (Fig. 2 *h*) forming a thin, bluntly pointed, scoop-like blade. Dimensions of *a* setae: length approximately 10 mm., diameter near base about 26μ , in proximal half of stem $14-15.5\mu$, distal half $8-11\mu$ thick and $15-18\mu$ broad, near the blade $12.5-14\mu$ broad, thickness of blade about 1.5μ . Penial setae of the *b* bundle with a straight stem curved only at the distal end, tapering gradually and terminating in a flattened but not broadened blade which ends bluntly (Fig. 2 *g*), the distal half of the stem ornamented with rows of fine close-set teeth. Dimensions of *b* seta: length 3.6 mm., diameter near base 33.5μ , in middle of stem $20-21.5\mu$, near distal end 11μ , breadth of blade 7.5μ . It seems probable that Beddard was correct in describing a dimorphism of penial setae for the types of this species, but that he failed to observe the ornamentation of the outer setae; Michaelson on the other hand appears to have overlooked the lack of ornamentation of the *a* setae, but it is possible that in his specimens the *a* setae were also ornamented.

Spermathecae: the spiral diverticulum is to the outer side of the ampulla and duct, not to the inside as figured by Beddard; it is also considerably thicker (Fig. 3 *b*). On the left side the direction of the spiral is clockwise, on the right side anti-clockwise.

In other characters, both external and internal, this specimen is in essential agreement with previous descriptions.

Subfamily *DIPLOCARDIINAE*Genus *Dichogaster*, Bedd.*Dichogaster bolau* (Mich.) var. (Fig. 2 *j-l*).

For complete synonymy and bibliography up to 1900, see:

Dichogaster bolau, Michaelsen, 1900, *Das Tierreich*, x, *Oligochaeta*, p. 340.

Reference may also be made to:

Dichogaster bolau, Stephenson, 1923, *The Fauna of British India: Oligochaeta*, p. 472 (London).

Annobon, found under stones near edge of lake, 13. viii. 27; three clitellate specimens, one of which is very damaged, and a fragment.

Length: the uninjured specimen is 69 mm., the other not badly damaged specimen is without the tip of the tail but measures 58 mm. Maximum diameter 2 mm. Colour: one specimen is slightly tinged with red-brown pigment dorsally on segments 2-8, also the clitellum is red-brown; the other two specimens are apparently unpigmented.

Clitellum saddle-shaped on segments 13-21 or $\frac{1}{2}$ 22. Copulatory papillae as median ventral papillae at various intersegments (specimen 1 at 15/16 and 20/21; specimen 2 at 9/10, 10/11, 15/16, 20/21, 21/22 and 22/23; specimen 3 at 10/11 and 15/16). Dorsal pores: in the best-preserved specimen the first dorsal pore is visible at 5/6. Gizzards in segments 6 and 7. Septa 4/5 and 5/6 present, 6/7 apparently absent. Last pair of lateral hearts in segment 12. Nephridia in four rows on each side, sometimes a little irregular. Seminal vesicles, two pairs in segments 11 and 12. Penial setal sac muscles arise from the first intersegment behind their respective prostatic pores. Spermathecae: the septa have slipped back so that the anterior spermathecae lie in front of septum 7/8, the posterior pair partly in front of 8/9 and partly projecting into segment 9. Ovisacs present.

Penial setae: in general the penial setae agree with the descriptions for this species, but the size is unusually large and the distal end of the smooth seta forms a much less conspicuous blade than usual. Setae of the *a* bundle are 0.52-0.59 mm. long, 9 μ in diameter in the mid-region of the stem, narrowing to 4.5-5.5 μ towards the distal end; the distal end ornamented with about 6 large teeth arranged in two rows, a seventh smaller tooth may be present proximal to the others, and several of the more basal teeth are double (Fig. 2 *j*). Setae of the *b* bundle are 0.46-0.5 mm. long, about 6 μ in diameter in the mid-region of the stem narrowing to 3 or 4 μ towards the distal end, the distal end is slightly flattened (4 μ thick and 5.5 μ broad), the tip is flattened considerably but not broadened (3 μ broad and *ca.* 1 μ thick), and terminates in a slightly notched edge (Fig. 2 *k, l*); these setae are unornamented.

In other characters these specimens are in essential agreement with the descriptions of *D. bolau*.

Observations. In addition to the typical *D. bolau* at least five different forms or varieties of this species have been recognized, viz. *palmyicola* Eisen, *pacifica* Eisen, *octonephra* Rosa, *decanephra* Michaelsen and *malabarica* Stephenson. At least two other

species of *Dichogaster* appear to be closely related to *D. bolau*, viz. *D. malayana* (Horst)¹ and *D. rugosa* (Eisen); the former is primarily distinguished by the ring-shaped clitellum, and the latter by its pigmentation. The specimens under consideration differ from typical *D. bolau* as follows:

(1) Greater size; in this character they approach *palmicola* of Eisen, but differ from specimens referred to this variety by Stephenson², which are quite small.

(2) Pigmentation of one specimen (the others may be either faded or really not pigmented). In this character there is an approach to *D. rugosa*. Michaelsen³ makes the following statement concerning certain specimens of *D. bolau* from New Caledonia "Die Stücke von der Station am Fluss bei Cone sind mit einer Farben-Angabe über die lebenden Tiere versehen: Vorder-Ende 'rosarot'". Stephenson⁴ also describes var. *malabarica* as with a dark mid-dorsal stripe. It would therefore seem that a trace of pigmentation is of doubtful taxonomic significance in this species, and in the absence of other very definite distinguishing characters it is doubtful whether *D. rugosa* should be retained as a distinct species (the form of the distal end of the smooth penial setae (? *b*) is probably not sufficiently different to be treated as a specific character).

(3) Nephridia in four rows on each side. In this character the present specimens agree with *octonephra* and also with *D. rugosa*. In *decanephra* there are five rows while in the other forms under consideration there are only three.

(4) Two pairs of seminal vesicles in segments 11 and 12. The additional pair of seminal vesicles also characterizes *octonephra*, *palmicola* and *pacifica*.

(5) Gizzards in segments 6 and 7 instead of 7 and 8. Stephenson⁵ records this peculiarity for specimens of otherwise typical *D. bolau* from Burma. The absence of septum 6/7 is paralleled by the absence of septum 7/8 in *palmicola* and *pacifica*.

(6) The distal end of penial seta *b* (the smooth seta) is not broadened or spoon-shaped, but merely flattened and slightly notched. Michaelsen⁶ has described a similar reduction of the distal end for *decanephra* from the island of Annobon. Although the present specimens differ from *decanephra* in their larger size and in the number of nephridial rows it is significant that the form of the penial setae should be similar, since they come from the same locality.

On the whole the present specimens agree most closely with *octonephra*, but from this variety they differ in the indications of pigmentation, in their larger size and in the form of the distal end of penial seta *b*. *D. bolau* appears to be a very variable species and it is doubtful how far the different forms described are really taxonomically significant.

¹ Stephenson (*Rec. Ind. Mus.*, xxxiii, p. 195) considers *D. bolau* and *D. malayana* to be identical.

² Stephenson, J., *Rec. Ind. Mus.*, xii, p. 348.

³ Michaelsen, W., in: Sarasin, F., and Roux, J., *Nova Caledonia, Zoologie*, I, p. 273. Wiesbaden.

⁴ Stephenson, J., *Mem. Ind. Mus.*, vii, p. 257.

⁵ *Ibid.*, *Proc. Zool. Soc. London*, 1931, I, p. 65.

⁶ Michaelsen, W., *Ergeb. d. Zweiten Deutsch. Zentral-Afrika-Exped.* 1910-11, I, *Zoologie*, p. 191. Leipzig.

Family LUMBRICIDAE

Genus *Eiseniella*, Mich.*Eiseniella tetraedra*, f. *typica* (Sav.).

Tristan da Cunha, under stones near settlements, 31. i. 26; two clitellate and one immature specimen.

Genus *Eisenia*, Malm. *em.* Mich.*Eisenia rosea* (Sav.).

Tristan da Cunha, under stones near settlements, 31. i. 26; three mature or semi-mature specimens; two immature specimens probably referable to this species.

Genus *Allolobophora*, Eisen *em.* Rosa*Allolobophora caliginosa* (Sav.).

Tristan da Cunha, under stones near settlements, 31. i. 26; two immature specimens probably referable to this species.

Genus *Dendrobaena*, Eisen *em.* Rosa*Dendrobaena subrubicunda* (Eisen).

Falkland Islands, Teal Inlet, 5. iii. 27; four clitellate specimens, two with clitellar bands, and eight immature specimens.

Clitellum including segments 26, $\frac{1}{2}$ 26, or 27-31. Clitellar bands including segments 28 or $\frac{2}{3}$ 28-30, *ca.* $\frac{1}{3}$ 31 or 31. In most specimens the gizzard is either confined to segment 17 or extends very slightly into 18; in one specimen it extends as far as $\frac{1}{3}$ 18 and in another to as much as $\frac{2}{3}$ 18. This restriction of the gizzard to one segment has not been recorded before in this species. Its occurrence in these specimens serves further to show that the distinction, based on this character, which separates *Eiseniella* from the other Lumbricid genera is not by any means definite (see Stephenson¹ for a discussion of this subject).

In all but two specimens there are two pairs of spermathecae normally situated, in segments 9 and 10 at intersegments 9/10 and 10/11. In two immature specimens there is only one pair in segment 9 at intersegment 9/10. Since both pairs are visible as rudiments in other equally immature specimens it seems certain that these two specimens are abnormal in this character.

Genus *Bimastus*, Moore*Bimastus tenuis* (Eisen).

Tristan da Cunha, under stones near settlements, 31. i. 26; one clitellate specimen, three immature specimens probably referable to this species. Falkland Islands, Teal Inlet, 5. iii. 27; one clitellate specimen.

The clitellate specimen from Tristan da Cunha appears to be quite normal except that the clitellar bands occupy three segments (28-30) instead of the more usual number 2 (29-30). The specimen from the Falkland Islands is peculiar in that it is quite un-

¹ Stephenson, J., *The Oligochaeta*, Oxford, 1931, p. 908.

pigmented; it is improbable that this is due to fading, since specimens of *Dendrobaena subrubicunda* in the same collection are normally pigmented. In this specimen the clitellar bands occupy $\frac{1}{2}$ 28–30. As in the specimens of *D. subrubicunda* from this locality, the gizzard is restricted to segment 17. In the specimen from Tristan da Cunha this is not so; it is interesting that the same peculiarity should appear in two different species from the Falkland Islands.

Genus *Lumbricus*, L.

Lumbricus rubellus, Hoffm., f. *tristani*, nov.

Tristan da Cunha, under stones near settlements, 31. i. 26; four clitellate, one semi-mature and four immature specimens, the last probably referable to this species (*Type* and *paratypes*).

In the five specimens in which clitellar bands are developed they include segments 27–31, instead of the normal 28–31. This peculiarity has not apparently been recorded for this species previously, and its occurrence suggests that the specimens from Tristan da Cunha are to be regarded as a distinct race. In the absence of definite evidence that such a variation does not occur occasionally in this species in Europe or elsewhere, it seems undesirable to create a separate subspecies for the specimens from Tristan da Cunha.

LUMBRICIDAE INCERTAE SEDIS

Tristan da Cunha, under stones near settlements, 31. i. 26; one abnormal clitellate specimen, two very juvenile specimens and several fragments.

Abnormal specimen. Length 73 mm. Diameter at anterior end 2 mm., in region of clitellum 3 mm., posteriorly 1.5 mm. Number of segments approximately 124; an accurate count is impossible on account of the poor state of preservation and the subdivision of segments in the clitellar region. Colour, pigmented dark purple-brown dorsally especially at the anterior end, decreasing in intensity and extent posteriorly, slightly pigmented ventrally on about the anterior 12 segments, clitellum pallid whitish brown.

Prostomium prolobic. Clitellum on right side including segments 39–47, on left side segments 39–48; owing to irregularities of segmentation segment 39 on the left side corresponds to 39 and 40 on the right side, while segment 41 on the right side corresponds to segments 40 and 41 on the left side. Clitellar bands on right side 39– $\frac{1}{2}$ 42, on left side 40–46. Copulatory papillae on left side on segments 19 and 25. First dorsal pore 6/7 (?). Spermathecal pores not visible externally; from internal examination the spermathecae open between setal line *d* and the mid-dorsal line (*v. infra*). Female pores not visible externally. Male pores on swollen papillae external to seta *b*, on the right side on segment 19, on the left side on segment 24. Intersetal distances: the setae are widely paired, *aa* : *ab* : *bc* : *cd* : *dd* = approximately 3 : 1 : 2 : 1 : 5 at the anterior end.

Internal anatomy. Owing to the poor state of preservation it is impossible to give a detailed account of the internal structure.

Gizzard confined to segment 29.

Reproductive organs: right side: two spermathecae at intersegments 14/15 and 15/16; two testes and spermiducal funnels, free, in segments 15 and 16; five seminal vesicles,

in 14 from septum 14/15, in 15 from 15/16, in 16 from 15/16, in 17 from 16/17 and in 18 from 17/18; the last empty sacs without contents; an ovary and oviduct in segment 18. Left side: three spermathecae at intersegments 15/16, 17/18 and 18/19; testes and spermiducal funnels, free, in 16, 18 and 19; seminal vesicles apparently absent; ovary and oviduct apparently absent.

It is impossible to refer this specimen to any familiar species. If the right side alone is considered and the anterior testes and funnels assumed arbitrarily to be in their normal position in segment 10 the gizzard would lie in segment 24 and the clitellum on about segments 34-42. If the gizzard is assumed to be in a normal position in segment 17 the clitellum would be situated on about segments 27-35. Neither of these positions, when taken in conjunction with other characters, fit any known species, and in any case the interval between the anterior testes and the gizzard is exactly twice the normal interval (fourteen segments instead of seven). On account of the dorsal position of the spermathecae and the restriction of the gizzard to one segment, this specimen might at first sight be referred to the genus *Eiseniella*, especially as *E. tetraedra* occurs in the same collection. Unfortunately the position of the male pores lateral to setal line *b* precludes this identification. In specimens of *Dendrobaena subrubicunda* from the Falkland Islands, described in the present communication (p. 288), the gizzard was found to be confined frequently to one segment; unfortunately the dorsal position of the spermathecae make it improbable that the abnormal specimen under consideration is referable to this species; moreover *D. subrubicunda* has not as yet been recorded from Tristan da Cunha. The dorsal position of the spermathecae suggests that it belongs to the genus *Eisenia* (since it is not either *Eiseniella* or, on account of the free testes, *Octolasion*). Michaelsen¹ observes that in some species of *Eisenia* the gizzard occupies only a part of segment 18 in addition to segment 17. In *E. veneta*, the only commonly peregrine species of this genus in which the setae are not closely paired, the clitellar bands are in the form of two pairs of tubercles and not a continuous wall as in the present specimen. In any case, on account of the intense pigmentation, this specimen cannot be referred to *E. rosea*, the only *Eisenia* recorded from the island, and it is equally certain that it cannot be identified with any of the other lumbricid species so far known to occur on Tristan da Cunha (*Lumbricus rubellus*, *Allolobophora caliginosa* and *Bimastus constrictus*).

The cause of the extreme abnormality of this specimen is quite obscure. Hyper-regeneration of segments has not been recorded in the Lumbricidae which, on the contrary, usually regenerate fewer than the normal number of segments when the anterior end is removed. This phenomenon is, however, known in the allied form *Criodrilus*. There are no obvious signs of injury in the present specimen and, in the absence of further evidence, the abnormality would seem to be more probably of a developmental nature. It may be compared with the abnormal specimen of *Microscolex georgianus* described previously (p. 277), in which the prostatic pores are situated very far back and abnormally reduplicated.

¹ Michaelsen, W., *Ann. Mus. Zool. Acad. Imp. Sci. St Pétersbourg*, xv, 1910, p. 9.

